SPECIAL PROTECTION AREAS

MONTGOMERY COUNTY, MARYLAND

Special Protection Area Program Annual Report 2005

Prepared by the Montgomery County Department of Environmental Protection in Cooperation With the Department of Permitting Services and the Maryland-National Capital Park and Planning Commission

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LIST OF ACRONYMS

BIBI	Benthic Index of Biological Integrity
BMP	Best Management Practices
CSPS	Countywide Stream Protection Strategy
DEP	Department of Environmental Protection
DNR	Maryland Department of Natural Resources
DPS	Department of Permitting Services
DPWT	Department of Public Works and Transportation
EPA	United States Environmental Protection Agency
IBI	Index of Biological Integrity
MNCPPC	Maryland National Capital Park and Planning Commission
SPA	Special Protection Area
SWM	Stormwater Management
TDR	Transfer Development Rights
TSS	Total Suspended Sediment
USGS	United States Geological Survey
WSSC	Washington Suburban Sanitary Commission

LIST OF FIGURES

EXECUTIVE SUMMARY

I. GENERAL

A. Historically, sediment and erosion control and stormwater management (SWM) requirements have not been given the same priority as achieving desired densities in highly impervious Special Protection Area (SPA) developments. This continues to cause problems arriving at cost-effective and practical siting decisions for sediment and erosion control structures and stormwater management facilities. In some cases, these decisions have required locating stormwater management quantity structures in environmentally sensitive stream valley buffers, areas with high water tables, or without proper maintenance access because little room was provided in other less environmentally sensitive areas in order to achieve desired lot yields.

B. Monitoring of best management practices (BMP) is currently done by private consultants paid for and managed by the developer. This has made it extremely difficult and time consuming for the County to ensure that this monitoring was done in a consistent manner among many different consultants, and that the data was of known quality.

C. There are continuing conflicts between SPA goals for environmentally sensitive developments and Road Code and other requirements that sometimes foster increased impervious areas and excessive use of cut and fill to minimize road grade changes.

D. Utility installation, while not required to comply with SPA requirements, should as a matter of environmental stewardship.

E. One of the anticipated outcomes of the SPA program was to test and validate the effectiveness of new and innovative sediment and stormwater control devices. Currently, approximately 95 percent of approved SWM treatment trains use the same treatment technology, minimizing the ability to test new technologies.

II. BMP MONITORING PROGRAM

A. Sediment and Erosion Control Effectiveness

1. Sediment

Sediment and erosion control devices receiving runoff with Total Suspended Sediment (TSS) concentrations greater than 100 mg/l (likely to occur during the early development periods involving cutting, filling and grading) are generally effective (median value of 86 percent difference in concentrations entering and leaving the structure). Devices become less effective when water with lower total suspended solid concentrations less than 100mg/l enters the basin or trap (median value of only 22 percent difference in concentrations entering and leaving the structure).

There appears to be a lower limit to sediment removal that can be achieved using current designs. This lower limit appears to be reached when site development reaches a stage where roads are in place, lots are final graded, and stormwater is being conveyed through a storm drain system to the sediment and erosion control devices. Sediment and erosion control devices are not designed to function as stormwater control BMPs (i.e., do not release runoff at the design volumes that the stormwater BMPs are designed to do). Downstream stream channels can and are being damaged by this practice. Sediment previously trapped and removed in the devices can be re-suspended in latter runoff events.

2. Thermal Impacts

Sediment control traps are designed to retain a permanent pool of water. During larger rain events, this warm pool of water is flushed out to the receiving stream. The result is a brief sharp increase of water temperature in the stream. These brief temperature spikes have not resulted in observable permanent damage to the downstream biological communities.

B. Stormwater BMP Effectiveness

1. Sediment

Once development is completed, the sediment and erosion control structures are converted to stormwater control facilities. Six projects provided post-development monitoring data on stream embeddedness, a measure of the extent that sediment has covered stream bottom riffle cobble and rock habitat. No impact was observed from five of the six projects. One project, Shady Grove Road, had embeddedness impacts during development, but post-development monitoring data indicated embeddedness has been reduced to pre-development levels.

2. Thermal Impacts

Post-development temperature monitoring of stormwater control BMPs has been completed at eight projects. Results show no difference in upstream and downstream water temperatures, indicating that the goal of minimizing temperature impact has been achieved on these eight projects.

3. Groundwater

Six projects had submitted post-development groundwater monitoring data. Five of the six projects showed no groundwater impact. The results of groundwater monitoring of one project indicated that groundwater levels had been impacted by the project. Data from the Briarcliff project indicates that groundwater levels have been impacted by the project. Before and during development the Briarcliff data matched very well with a nearby United States

Geological Survey (USGS) well, which has been used as a control. Since development was completed, groundwater levels at the Briarcliff site have dropped in relation to the USGS well. This indicates that groundwater recharge has been affected by development of the site.

III. STREAM MONITORING PROGRAM

A. General Observations

1. Construction of new SPA development projects over the last ten years has been concentrated in three areas: 1) Traville – located in the headwater area of Piney Branch, 2) the Right Fork of Paint Branch, and 3) Clarksburg Town Center.

2. Two droughts in recent years, 1999 and 2002, had a negative effect on the biological health of all streams in these SPAs. In streams that were also influenced by development related stressors, stream conditions further declined.

3. The biological community in a stream undergoes a significant degree of change from impacts during the construction phase of development.

4. The level of decline varied with the intensity and imperviousness levels of the new development. Streams in subwatersheds where large areas of grading and filling occurred as part of the development process are showing greater decline in stream conditions.

5. The recovery is dependent on the intensity of the development and the resulting level of imperviousness thus far. Streams have not recovered to pre-development conditions.

B. Stream Monitoring Results

1. **Piney Branch SPA**
   Construction of large-scale development projects has been ongoing in the Piney Branch watershed since 1995, but for the most part development is completed in this watershed. Development on the Traville property, located in the upper portion of the Piney Branch watershed, was completed in 2004. The year 2005 was the first year that Piney Branch did not receive runoff from large development sites. All stormwater runoff is now routed through water quality/quantity structures before being released to the stream. Stream monitoring results from 2005 indicate improved stream conditions throughout Piney Branch which is believed to be the result of three years of good stream flow following the 2002 drought and cleaner stormwater runoff due to water quality structures built into new developments and the vegetative stabilization of completed projects. Biological heath improved somewhat in 2005 with the

average Benthic Index of Biological Integrity (BIBI) rating rising to *fair* from a *poor* rating in 2004, but not to pre-construction levels of *good* to *excellent*.

2. **Paint Branch SPA**
The 2005 stream monitoring results document improved stream conditions throughout the Paint Branch SPA. To a large extent, this improvement also appears attributable to three years of good stream flow following the 2002 drought. Improvement is greatest in the Right Fork sub-watershed where most of the new development has occurred. Improved biological health in the Right Fork during 2005 follows four years of declining health. The Department of Environmental Protection (DEP) believes that completion and stabilization of new development projects and consequently less sediment entering the stream is partly responsible for this change. Biological heath is recovering, but not to pre-development levels. Numbers of brown trout were higher in 2005 than 2004.

Concern continues about the Good Hope Tributary because historically Good Hope has supported most of the trout spawning and nursery habitat in Paint Branch. In 2005, there was no observed increase in numbers of young-of-year trout from 2004, meaning that spawning activity remains very sparse despite generally favorable stream flow conditions. Observations made by the Maryland Department of Natural Resources (DNR) suggest sedimentation of the stream bottom along portions of lower Good Hope may be inhibiting trout spawning. DEP has installed one new stormwater pond and retrofitted two others in upper portions of the Good Hope watershed to provide stormwater management for older development where stormwater controls had not then been required. For most small storms, these projects have been shown to reduce peak storm flow in Good Hope by 77 percent. DEP believes that these projects will reduce stream bank erosion rates and consequently sedimentation of downstream habitat. Future monitoring will determine if this results in more spawning success in lower Good Hope.

3. **Clarksburg SPA**
Land use change in the Clarksburg SPA has been far greater and has occurred over a shorter period of time then in the other three SPAs. In 2005, development was either complete or ongoing on 1,409 acres. Most of this new development is located within the Little Seneca Creek watershed and concentrated in and around the new Clarksburg Town Center. In many developments, sediment and erosion control devices have not yet been fully converted to stormwater management yet housing units have been occupied and final imperviousness has been added. Stream monitoring results from throughout the Clarksburg SPA in 2005 show the streams biological community continues to recover from the 2002 drought. However, within the stream monitoring stations located downstream from development sites, impacts from the 2002 drought have been greater and recovery has been slight when compared with other stations in small Clarksburg subwatersheds not

affected by development impacts. Development impacts appear to have accentuated drought impacts and have inhibited recovery. Development impacts appear to be greatest in the Town Center Tributary due to extensive land disturbance and the degree of resulting new imperviousness land area within this subwatershed. Another tributary (tributary 104) with large areas of the drainage area in active land disturbance is beginning to exhibit signs of impairment. DEP will continue to monitor all streams in the Clarksburg SPA to track stream health as more of the area develops.

1. **Upper Rock Creek SPA**
   The year 2005 was the second year of stream monitoring in this newly created SPA. Stream monitoring is only done in small tributaries that receive runoff from large parcels of developable land. Results from 2005 are similar to 2004 and show biological health rated as *good* in all six tributaries. These results will serve as a baseline against which future results will be compared as the land parcels develop.

IV. RECOMMENDATIONS

A. SPA developments should be developed with achievement of the water quality performance goals considered at every step. All water quality/quantity structures should be fully integrated into the site design from the start. Decisions on lot siting, location, and roads need to be made after, or at least at the same time, as water quality/quantity structures. These decisions have a large impact on natural drainage patterns, stream systems, sediment control and stormwater facility options. These decisions should include consideration of maintenance access requirements, costs and maintainability of stormwater management facilities.

B. County Code Chapter 19 should be revised so that future BMP monitoring will be managed by the County and not by SPA project developers. Monitoring costs should be funded through a BMP monitoring fee assessed to project developers. It is anticipated that there would be no net cost increase to developers.

C. Current changes to the Road Code are under consideration by the Department of Public Works and Transportation (DPWT). Changes to the Code that allow for greater road slopes and other changes that support SPA goals for environmentally sensitive developments should be implemented. In addition, a grading ordnance should be enacted so that extensive mass grading will not occur on a SPA development site.

D. The County will coordinate with the Washington Suburban Sanitary Commission (WSSC), the regulatory agency for utility sediment and erosion control, to develop recommendations on how utilities can be installed in accordance with SPA criteria.

E. Developers should be encouraged to try a variety of approved sediment and erosion control and stormwater technologies. As an alternative, the County can try a variety of new technologies on County owned facilities, monitor their effectiveness, and add technologies that are successful to the existing proven technologies currently in use by private business.

F. Sediment and erosion control devices should be upgraded with a finer filter mesh or converted to function as stormwater controls once site development reaches a stage where roads are in place, lots are final graded, and stormwater is being conveyed through a storm drain system.

SPECIAL PROTECTION AREA
2005 ANNUAL REPORT

I. PURPOSE AND BACKGROUND

The Special Protection Area Program was established in 1994 by Montgomery County Code Chapter 19, Article V (Water Quality Review-Special Protection Areas, Section 19-67) and the program was implemented through Executive Regulation 29-95, *Water Quality Review for Development in Designated Special Protection Areas*. The law and regulations require an Annual Report be prepared that summarizes available monitoring results of stream and best management practices collected within SPAs. This report is submitted annually to the County Executive and County Council with a copy to the Montgomery County Planning Board.

The County Council has designated four areas within Montgomery County as Special Protection Areas (Figure 1). The designated areas are Clarksburg Master Plan SPA, Upper Paint Branch SPA, Piney Branch SPA, and the Upper Rock Creek SPA. Upper Rock Creek was designated as an SPA on February 24, 2004, with the adoption of the Upper Rock Creek Master Plan. All four SPAs have existing water resources or other environmental features directly relating to those water resources that are of high quality or unusually sensitive; and where proposed land uses would threaten the quality or preservation of those resources or features in the absence of special water quality protection measures which are closely coordinated with appropriate land use controls. Appropriate land use controls are those that help ensure that the impacts from master planned development activities are mitigated to the greatest extent practicable. Examples of these controls include reducing imperviousness, minimizing grading, and saving natural features such as forested stream buffers. Special water quality protection measures include sediment control and stormwater management structures that go beyond current minimum standards.

The SPA program requires the Montgomery County Department of Permitting Services (DPS), the Department of Environmental Protection (DEP), and the Maryland-National Capital Park and Planning Commission (MNCPPC) to work closely with project developers from the outset of the regulatory review process to minimize impacts to SPA stream conditions. SPA permitting requirements guide the development of concept plans for site imperviousness, site layout, environmental buffers, forest conservation, sediment control and stormwater management. Applicant requirements to carry out monitoring of sediment/SWM BMPs are also defined through this process. A pre-application meeting presents the project developer with the critical natural resource parameters that need to be maintained in order to protect existing high quality stream conditions. Protection of these natural resource parameters is guided by performance goals developed for each development project. Achievement of the performance goals through the site plan design process and accompanying permitting requirements for sediment, erosion and stormwater management controls requires close coordination between the project's design team and environmental, regulatory and planning agencies.

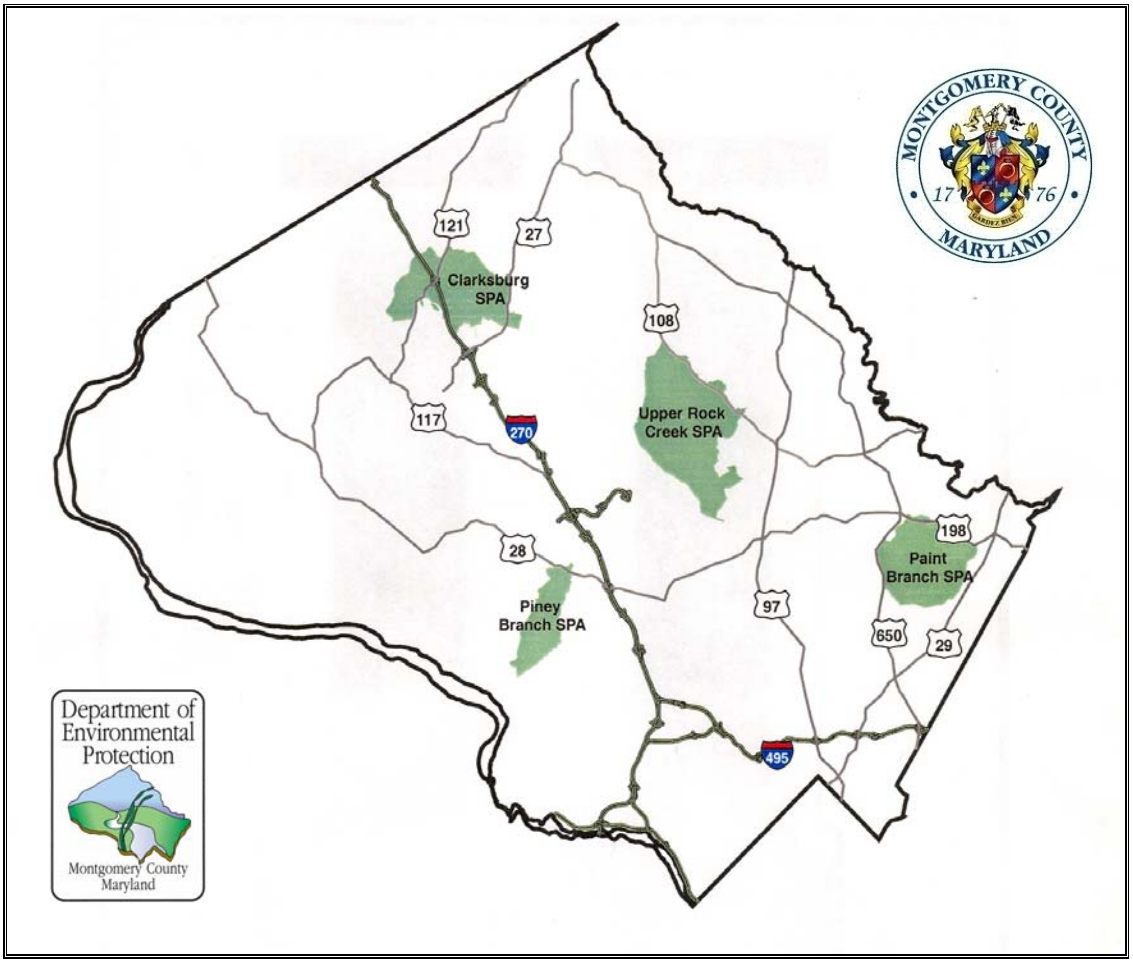

Figure 1. Location of Special Protection Areas in Montgomery County

II. SPA REVIEW PROCESS

A. PLAN REVIEW PROCESS

As reported in the 2004 SPA Annual Report, the protection of those features necessary to sustain important natural resources has not always been successful in approved SPA development plans. Protection of these natural resource parameters is guided by performance goals developed for each development project as part of a Water Quality Plan. Successful incorporation of the performance goals into the Water Quality Plan and the site design process requires continuing innovation and close coordination and review between the project's design team and environmental, regulatory and planning agencies.

When protection of identified critical natural resources is not considered in the early stages of preparing a development plan, opportunities for sustainability are not fully achieved and resources may not be fully maintained. DPS and DEP have encountered problems with site planning decisions that have greatly complicated arriving at cost-effective and practical siting decisions for sediment and erosion control structures and stormwater management facilities. In some cases, for example, these decisions have required locating sediment structures and stormwater facilities in areas with high water tables or without proper maintenance access.

There are also continuing conflicts between SPA goals for environmentally sensitive developments and Road Code and other requirements that, sometimes, unnecessarily foster increased impervious areas and excessive use of cut and fill to minimize road grade changes. These changes from watershed development complicate the protection of natural stream systems.

Closer coordination is needed between the environmental, permitting, and planning agencies and SPA project design teams to assure that planning and subdivision decisions on lot siting decisions, lot coverage, and Road Code requirements do not preempt locations for practical, cost-effective sediment control and stormwater management facilities. Decisions on lot siting, location and on roads need to be made with a fuller appreciation of implications these decisions have on natural drainage patterns, stream systems, sediment control and stormwater facility options. These decisions must also better understand and accommodate maintenance access requirements, costs and maintainability of stormwater

B. BMP MONITORING

County staff has been working for some time to consider changes to Chapter 19 and BMP monitoring requirements in SPAs. We propose that BMP monitoring responsibility would be managed by the County rather than by project developers and funded through a one-time fee paid to the County. This would give the County direct control over the quality assurance/quality control requirements and data submission requirements. The County’s other annual stream monitoring activities within SPAs would not change. The

County will continue to annually monitor and report upon trends in stream conditions in all SPAs. All other SPA water quality plan review and reporting aspects of the SPA program would also remain the same.

New projects would pay a fee for both stream and BMP monitoring. Developers with approved water quality plans and already engaged in BMP monitoring at their own costs would be given the option of either continuing this monitoring or ceasing the monitoring and, instead, paying a prorated fee to support BMP monitoring by the County. The BMP monitoring sites chosen by the County may or may not be located on sites where the project developer elects to pay the BMP monitoring fee. In carrying out its BMP monitoring, the County would plan to solicit competitive bids for participation in a task order contract and retain three or more firms to carry out selective BMP monitoring tasks.

It is estimated that a fee of $400 per acre would be required to support the County's BMP monitoring in SPAs. As in the current SPA stream monitoring fees, the County would seek to have fee revenues earmarked to support future BMP monitoring over a three to five year time horizon. This charge could serve as an alternative to the estimated $900 per acre developers may now incur as they independently conduct BMP monitoring for their development project, analyze the data, and report results to the County. This change should result in no net increase in total costs. The BMP monitoring fee would be in addition to the $505 per acre charged to developers for the County to carry out the required stream monitoring program.

The County would target future BMP monitoring to focus within the Clarksburg SPA to enable collected data to be combined with supporting data being gathered through an ongoing and extensive interagency monitoring effort in the watershed. This data includes supplemental data from five stream flow monitoring stations and nutrient sampling in surface and groundwater. BMP monitoring would also be done within the Upper Rock Creek SPA (8 percent impervious cap) and the Upper Paint Branch SPA (10 percent impervious cap). Monitoring of BMPs within these lower impervious limits would provide information on BMP efficiency within lower densities than those approved for Clarksburg. BMP monitoring and the per acre fee would provide information on the effectiveness of sediment and erosion control devices and SWM treatment trains; the ability of infiltration to maintain groundwater recharge to receiving streams; and changes to surface hydrology due to landscape changes in the developing SPA watersheds. Once an adequate number of a particular BMP has been identified to be monitored, resources could then be allocated to cover other BMP types. This cannot be done under the current SPA law.

C. BMP TECHNOLOGIES

The SPA regulations require BMP monitoring to be done at select stormwater management and sediment and erosion control devices. The information collected, when combined with data from the County's biological stream monitoring program, could then be used to assess and refine the effectiveness of the County's current BMP designs over a range of drainage areas, land use, and impervious levels.

Staff has compiled permitting information on all monitoring being required under the BMP monitoring program. Results offer an opportunity to evaluate the current direction of the program and whether revisions are necessary. The current program evolved as individual SPA properties came in for Water Quality Plan approval as part of the development permitting process. While individual BMP monitoring plans submitted by project developers meet the specific monitoring needs for each property, staff's review indicates that the range of different BMP designs is not being fully provided to produce comparative cost-effectiveness information over the full range of BMP options originally envisioned. This is primarily because developers, choosing from the wide variety of BMP options available under the State stormwater manual, tend to choose those most tried and true, least costly options known deemed most likely to gain positive and timely permitting approval.

The DPS estimates that about 95 percent of all treatment trains currently approved for the SPA program will consist of a BaySaver – sand filter – sand filter – dry pond (with extended detention).

BMP monitoring to date has almost been entirely focused on the pre-development and during development phases. Very few post-development monitoring projects required in the Water Quality Plans for individual SPA projects have actually been done thus far. The few BMP monitoring projects to date (mostly in older Piney Branch SPA developments) has consisted of end-of-pipe monitoring to assess the impacts of the BMP discharge to the receiving stream. However, development in the Clarksburg SPA has proceeded rapidly, with much of the development now at the stage where sediment and erosion devices are soon to be converted to SWM controls. Thus, it would be an appropriate time to consider fundamental changes in the SPA program that could produce an improved approach to BMP monitoring and better, more comprehensive results covering a wider variety of modern practices.

III. RESULTS

A. GENERAL

This section of the SPA annual report presents information on stream and BMP monitoring results from 2005, what parts of the SPA program appear to be working well and what parts do not, and indicates program improvements that are being pursued to address identified program deficiencies.

Stream monitoring results continue to produce a broad range of trend data that will help assess how effective the water quality plan development and review process, performance goal setting, improved site planning and intensive BMPs are in mitigating development impacts to receiving streams. Key stream indicators used in these evaluations are measures of biological resource diversity and quality, physical stream channel and habitat conditions, and water chemistry. As new development projects within SPAs and new SPAs have been added, the program has added new monitoring stations to provide a measure of baseline stream conditions. Stream monitoring methods used are comparable with those of the Maryland Biological Stream Survey, enabling use of the state's data to help supplement the coverage provided through county monitoring.

Only a few large development projects within SPAs have been fully completed and stabilized with sediment controls removed and replaced by permanent stormwater control structures that are being maintained by the County. The County is at the brink of collecting monitoring data that will begin to assess post development conditions, SWM BMP effectiveness, and the degree of possible long-term recovery of biological communities from development phase impacts.

B. BMP MONITORING

The goals of the BMP monitoring program are to assess the effectiveness of representative SPA sediment and erosion control devices and the effectiveness of different types of permanently installed stormwater management BMPs. Consultants are contracted by individual project developers who are responsible for monitoring BMPs as specified in the water quality plan. Each consultant follows County methods and procedures. Recognizing practical siting, feasibility and cost considerations, BMP monitoring is not required for all SPA development projects. There are 47 properties, totaling 317 acres where, because of the relatively small property sizes or other reasons, no BMP monitoring is being required.

DEP has received enough BMP monitoring data to begin evaluating the effectiveness of sediment and erosion control devices. County regulations requires all SPA sediment and erosion control structures be designed to dewater before the water warms up and further that dewatering devices be designed to the extent possible remove fine particulate matter such as clay from runoff. DEP's monitoring of these devices targets how effective these devices are in removing fine total suspended sediments and in minimizing thermal impacts to receiving streams.

Fifteen projects in the SPAs are currently monitoring water temperature in nearby or downstream streams to determine if thermal impacts occur as a result of the development. Twelve of the development projects are still under development and three have been completed.

SEDIMENT AND EROSION CONTROL EFFECTIVENESS (DURING DEVELOPMENT

SEDIMENT

The 2004 SPA Report (October 2005) reported that sediment control structures had a median value of 78 percent efficiency in removing fine suspended material from runoff. This report provides additional information on sediment and erosion control device effectiveness, which builds upon the findings presented in the 2004 report. Monitoring results continue to be reported as inflow and discharge concentration data due to the costs and difficulty associated with monitoring storm flows. Others have also evaluated sediment and erosion control device effectiveness using similar concentration data for the same reasons. Grab samples are collected during, and/or within a 24-hour period immediately after a storm. The data seems to be reliable and consistent. However, without accompanying flow data, grab samples cannot represent the total load of sediment moving through a structure. In the coming year, DEP expects to begin receiving data collected by automated samplers throughout entire storms that can be used to more confidently evaluate the effectiveness of BMPs. This data, because it is collected through an entire event, will certainly be representative of the entire storm and not a brief point in time. Obtaining reliable flow data from sediment and erosion control structures has proven difficult because of design changes to the structure, which can add additional flow pathways to be monitored, or periods when no positive flow is occurring in the inlets.

To date, DEP has now received TSS grab sample data collected after 52 storms from different SPA sediment control structures at different stages of development (Figure 2). Monitoring results show sediment and erosion control devices receiving dirty water (likely to occur during the early development periods involving cutting, filling and grading) to be generally effective. Results show a general decrease in sediment concentrations leaving sediment control basins and traps from that entering the basin or trap with an interquartile range from 54 percent – 96 percent (25th and 75th percentile values) and a median value of 86 percent, when properly installed and regularly maintained (Figure 3). At concentrations below 100 mg/l, the results are more variable.

In those instances where the stormwater TSS concentration in the forebay of a structure was relatively clean (less than 100mg/l) almost as many samples had higher concentrations leaving the site then those that had lower concentrations leaving the site (Figure 4). The relatively cleaner water (less than 100mg/l) entering the sediment and erosion control devices could be the result of the sampling taking place fairly late in the grading and site preparation process - during the period where most of the cut and filling was completed and final lot and road grades were completed. Soils are compacted during this phase to maintain the surveyed final grades. The higher outfall concentrations could be from the re-suspending of fine clays and silts already in the control structure basin. As projects get closer to completion and less exposed earth is present on a site, there comes a point where there may be more sediment accumulated from prior storms getting washed out of structures than is being trapped. The County is evaluating this further and may determine that once development reaches this late stage that the sediment and erosion control devices are cleaned and maintained and the dewatering devices are re-wrapped with finer mesh size filter cloth to more efficiently filter out finer particles or that the sediment and erosion control device is changed over to a stormwater facility as soon as the primary grading, cutting and filling is complete.

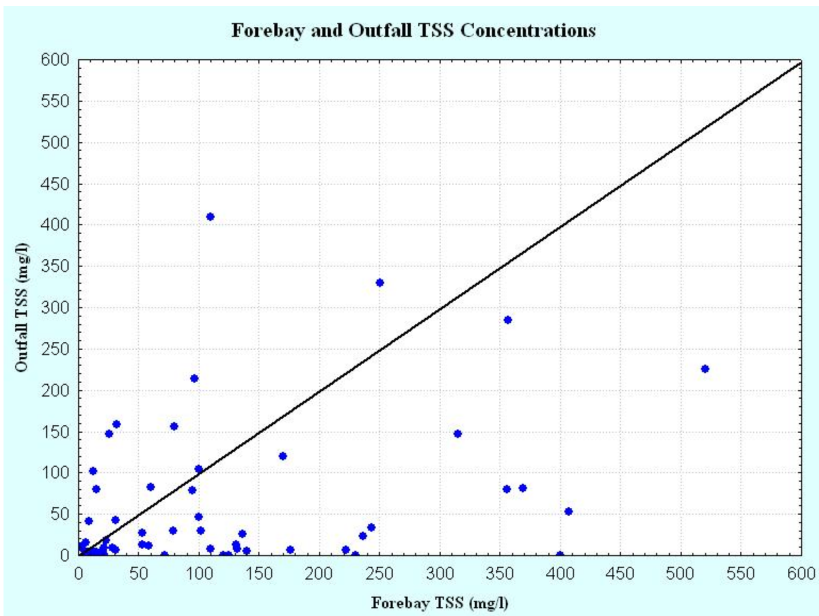

Figure 2. Forebay and Outfall TSS Concentrations

Solely depending on engineered solutions to prevent impacts to a receiving stream is not often the best solution. Rolling topography and existing minimum road grade requirements can require extensive amounts of cut and fill to occur. Without a grading ordinance in place, extensive mass grading can occur on a development site. Adoption of a grading ordinance with requirements for phased development and stabilization may be a way of achieving more control over mass grading impacts.

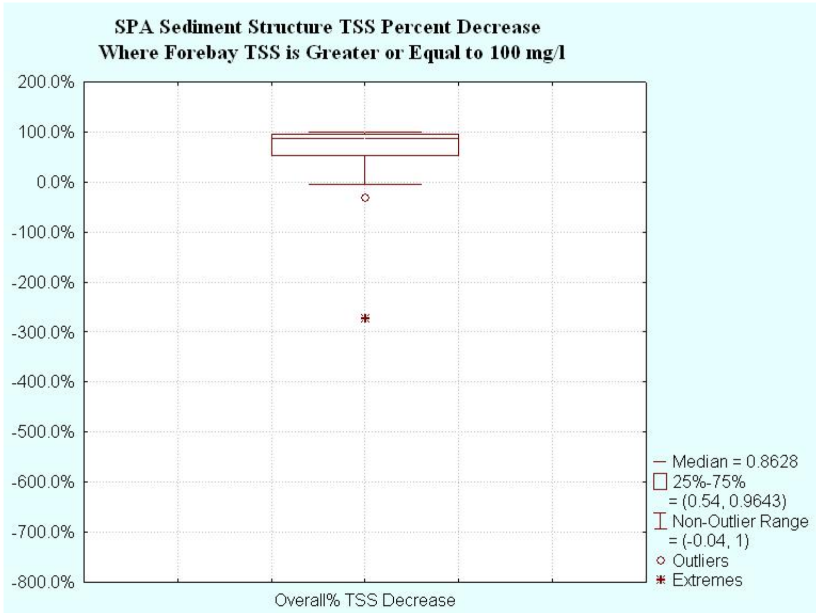

Figure 3. Percent Difference in Forebay and Outlet TSS Concentrations where Forebay TSS Values are Greater or Equal to 100mg/l

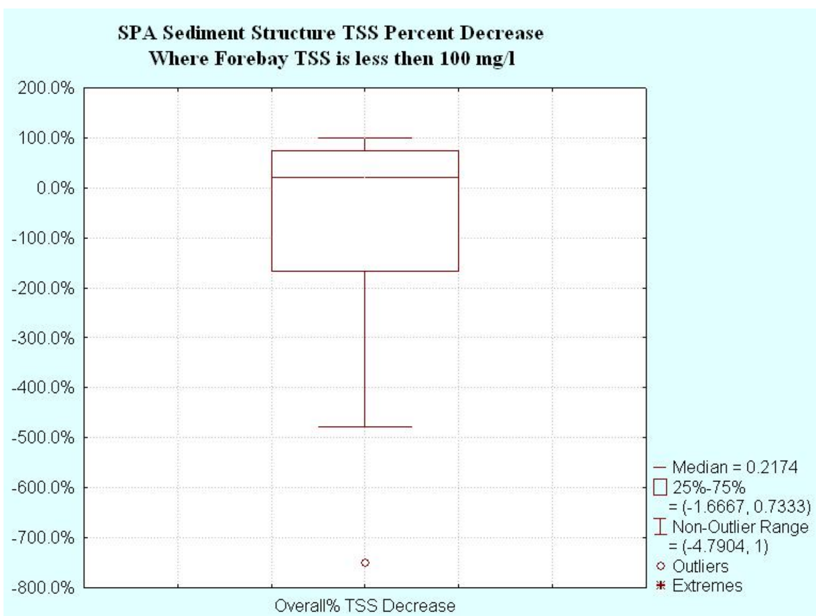

Figure 4. Percent Difference in Forebay and Outlet TSS Concentrations where Forebay TSS Values are Less Than 100mg/l

Temperature

Data available for this report continues to support findings on thermal impacts originally cited in the November 2004 SPA report. Monitoring data from nine projects under development show no thermal impact on receiving streams. Data from three projects, still under development, do show thermal impacts during the development period. In all three cases, thermal impact is caused by the release of warm water from sediment control structures. Sediment control structures are designed to retain a permanent pool of water. Between storm events, the permanent pool warms up. During larger rain events, the warm pool of water is flushed out through the riser structure and to the receiving stream. The result is a brief sharp increase of water temperature in the stream. Temporary elevated thermal discharges could occur when sediment and erosion controls have become clogged due to inadequate maintenance or have topped over from heavy periods of precipitation.

Although brief, these temperature spikes can raise the water temperature as much as ten degrees (F). Biological monitoring results from Wildcat Branch, one of the locations where temperature spikes have occurred, indicate no impairment to the benthic macroinvertebrate community.

Stormwater Management BMP Monitoring

This data reflects results of monitoring from development projects that have installed final stormwater controls and have stabilized upstream land uses that are fully vegetated and with sediment controls no longer necessary and removed. Fourteen SPA developments have started submitting post-development monitoring data. These developments provided data on the temperature, nitrogen, metals, or sediment impacts of the completed project on the receiving stream or monitored changes to groundwater levels. As post-development monitoring continues, the data will provide needed information on the effectiveness of the SPA program in minimizing impacts to the stream resources.

Sediment

Six projects provided post-development monitoring data on the degree of receiving stream channels embeddedness – a measure of the extent that sediment has covered stream bottom riffle cobble and rock habitat. No impact was observed from five of the six projects. One project, Shady Grove Road had embeddedness impacts during development, but post-development monitoring data indicated embeddedness has been reduced to pre-development levels.

Temperature

Stream water temperature is one of the most important factors in maintaining the biological health of streams. SPA BMP design features that help minimize temperature impacts include: 1) use of dry ponds for runoff quantity control that minimize standing pools that soak up excessive heat; 2) routing storm water through roadside swales slows conveyance and provides an opportunity for the warmest runoff (first flush) to infiltrate into the soil; and 3) sand filters and bio-filtration cells provide a cooling effect as warm storm water passes through cooler underground soil and sand matrices.

Post-development temperature monitoring has been completed at eight projects. Results show no thermal impact, indicating that the goal of minimizing temperature impact has been achieved on these eight projects. Four of the eight projects release stormwater to second order streams where dilution effects from stream flows likely hampered the detection of thermal impacts. As more projects are completed in headwater areas of streams data will become available on temperature impacts in these more sensitive streams.

GROUND WATER IMPACTS

The County requires some project developers to install and monitor wells on project sites to evaluate changes in groundwater levels as development occurs. As discussed in last year's SPA report (November 2004), most collected groundwater level data has, thus far, covered only pre-development and during-development conditions phases of development. Several years of groundwater monitoring is required after development projects have been completed before evaluation to assess permanent impacts on groundwater levels or groundwater quality can be made. When sufficient well data becomes available, DEP hopes to be able to assess how well stormwater infiltration devices are working to help support groundwater replenishment and stream base flows from the impacts of increased watershed impervious area. So far, DEP has only been able to identify groundwater impacts at the Briarcliff site discussed above. We will need data from more projects to be able to fully evaluate the effectiveness of stormwater management plans in maintaining groundwater levels. The hydrological monitoring ongoing in the Clarksburg SPA will allow assessment of changes in groundwater quality and quantity related to changes in stream flows as the SPA builds out. DEP and its interagency monitoring partners (the USGS, the EPA, and the University of Maryland) are only able to do this type of monitoring in the Clarksburg area because of costs and staffing required to maintain the gaging stations.

Six projects had submitted groundwater monitoring data. Three of the six projects had no impacts to groundwater levels. Data from one project was inconclusive. Data from the Briarcliff project indicates that groundwater levels have been impacted by the project. Before and during development, the Briarcliff data matched very well with a nearby USGS well that has been used as a control (Figures 5 and 6). Since development was completed, groundwater levels at the Briarcliff site have dropped in relation to the USGS well. This indicates that groundwater recharge has been affected by development of the site.

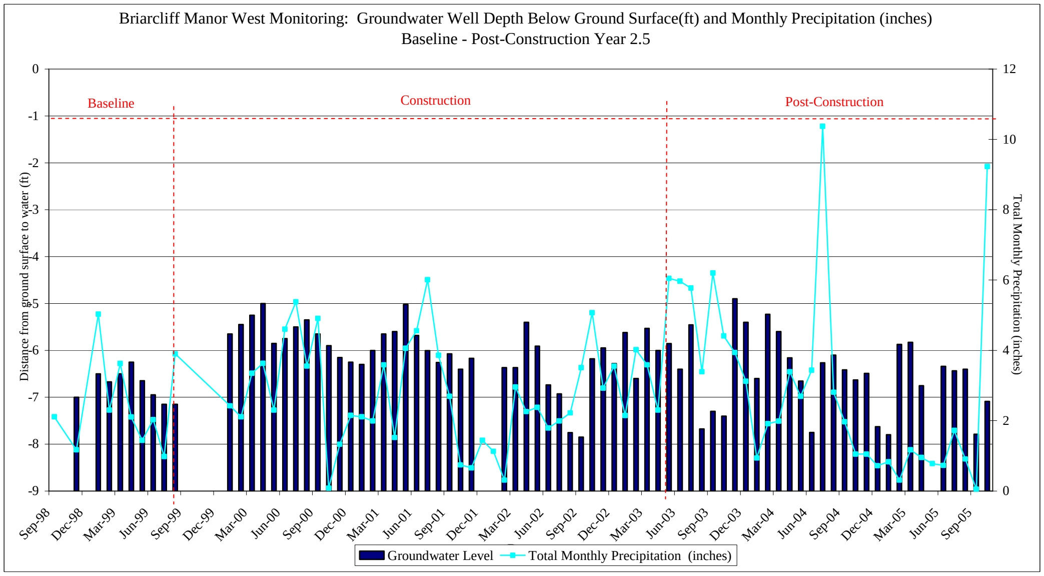

Figure 5. Briarcliff Manor West Groundwater Monitoring

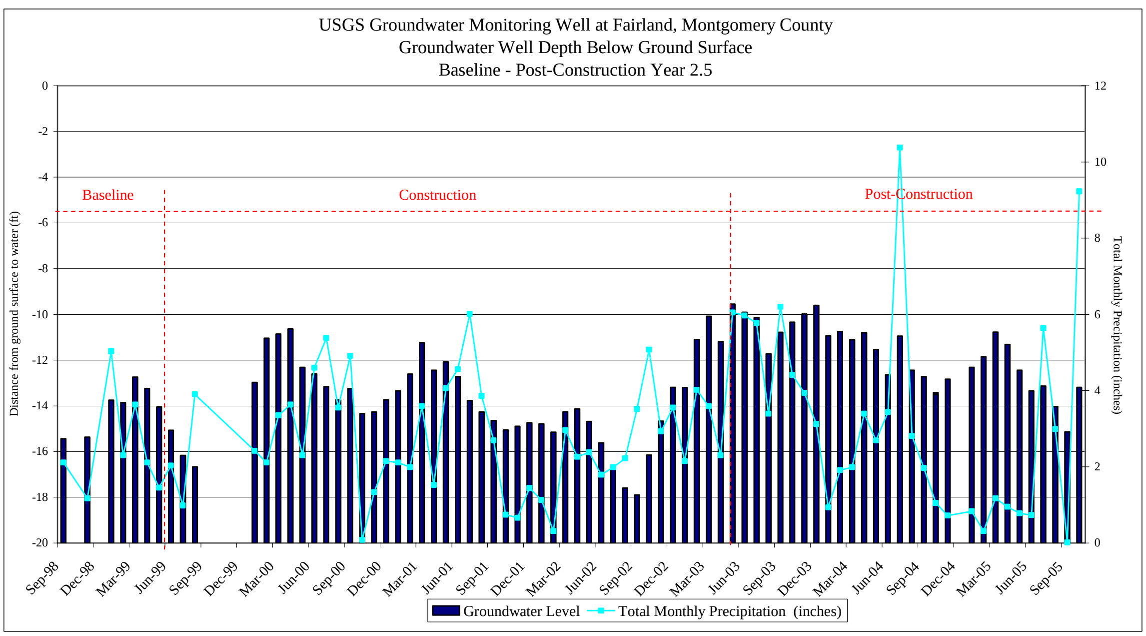

Figure 6. USGS Groundwater Well, Fairland

OTHER POLLUTANTS

Monitoring of some quality control SWM structures have yielded some preliminary results indicating they work to minimize the release of pollutants to receiving streams. The monitored pollutants include nitrogen, cadmium, lead, copper and zinc. For example, DEP has received some preliminary data on a StormCeptor water quality BMP that indicates slight reductions in pollutant concentrations. A StormCeptor is a device that is designed to remove grit, fine sediment and free oil from stormwater and it is typically applied at the beginning of a SWM treatment train. The water entering the structure has not generally contained high concentrations of pollutants and it can be difficult to measure the removal of pollutants that are only present at very low concentrations. Monitoring during the next three years will provide more conclusive information on the performance of the StormCeptor structure.

C. STREAM MONITORING PROGRAM

DEP began stream monitoring within three SPAs, Clarksburg, Piney Branch and Paint Branch, in 1995 and within the newly designated Upper Rock Creek SPA in 2004. Stream monitoring includes biological sampling of benthic macroinvertebrate and fish communities, habitat assessment, stream channel measurements, and water quality readings (dissolved oxygen, temperature, pH, and conductivity). Presently there are 57 fixed monitoring stations throughout the four SPAs where stream monitoring is done, 27 in Clarksburg, 14 in Upper Paint Branch, 10 in Piney Branch and 6 in the Upper Rock Creek SPA. Because of staff constraints, not all 57 stations can be monitored each year. In 2005, 50 stations were monitored during the spring benthic macroinvertebrate index period and 33 were monitored during the fish monitoring period. Fish stations typically take additional staff resources to complete.

GENERAL COMPARISON OF OBSERVED STREAM IMPACTS AMONG SPAS

The health of SPA streams is influenced by both manmade and natural stressors. Manmade stressors to the stream ecosystem include such things as: 1) increased sediment input from development sites, 2) increased levels of nutrients entering the stream which lead to higher rates of algae growth, 3) increased algal growth causing low dissolved oxygen levels at night, 4) thermal impacts as stormwater runoff from heated surfaces (e.g., roads and rooftops) and warm water flushed out of sediment traps enters the stream, and 5) increased peak flows during storm events. In addition, legacy impacts from historic land use changes have caused early sedimentation of stream valleys that can be eroded when disturbed by development activities or changes in runoff patterns.

In DEP's view, the most influential natural stressor is drought, which causes extremely stressful conditions in the stream. Stream habitat can be reduced to small isolated pools in the stream bed. Water quality can be impaired as water temperature becomes elevated and dissolved oxygen concentration becomes very low. Two droughts in recent years, 1999 and 2002, had a negative effect on the biological health of all SPA streams. In streams that were also influenced by manmade stressors, the biological health was further degraded. Following the 2002 drought, annual precipitation in the Montgomery County region was at or above normal. Stream base flows returned to normal during the period 2003 – 2005. Stream habitat recovered which allowed the biological community in most SPA streams to recover from drought conditions. In those streams receiving impacts from large-scale development activity, the biological community did not fully recover from drought conditions. Other natural stressors can include flooding, increased competition for resources and increased predation. Frequent flooding can increase bank erosion, loss of streamside vegetation and changes to stream bed composition.

The County has compared changes in SPA stream conditions relative to the intensity of changes in land uses that occurred. As anticipated, stream conditions have generally decreased as the imperviousness level of watershed development increased. For example, benthic macroinvertebrate monitoring results show Piney Branch, the most developed SPA tributary, has the lowest rated stream condition, while Ten Mile Creek, the least developed SPA tributary within the Clarksburg SPA , has the highest rated stream condition (Figure 7).

Watersheds such as Ten Mile Creek and Cabin Branch where little or no development has occurred have the highest quality stream conditions. Changes (Figure 7) observed in these watersheds are due to natural variability or from existing land uses.

Streams in subwatersheds where large areas of grading and filling of parcels are occurring as part of the development process are showing greater decline in biological health. In the Clarksburg SPA, for example, the Town Center tributary receives runoff from moderate to high intensity development within the new Clarksburg Town Center. Stream conditions declined sharply in this tributary from levels indicative of *good* condition (sustained during a six-year period, 1997 – 2002) to *poor* condition in 2003 and 2004. Several observed stream impacts were initially responsible for decline in this area, including, severe drought, high rates of algae growth, a water main break and associated sedimentation. Stream flows in the region were near or above average during 2003 and 2004 providing favorable conditions for biological communities to recover from severely stressful drought conditions that existed during 2002. However, the continued presence of fine sediment coating the stream bottom, primarily the result of discharge from development sites, appears to be hindering the recovery of biological health.

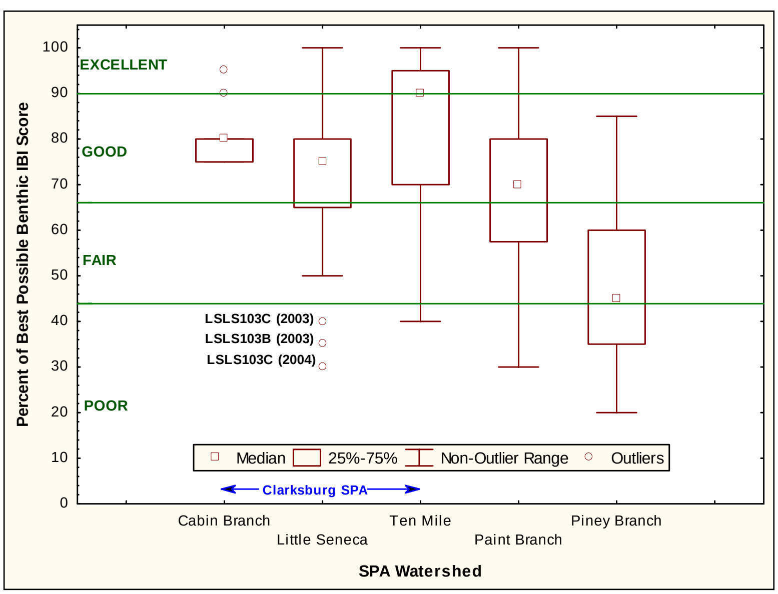

Figure 7. Results of all Benthic Macroinvertebrate Monitoring in SPA Watersheds (1995 - 2004)

Some of this fine sediment did not go through the filtering devices due to the storm exceeding the treatment capacity of the sediment and erosion control devices. Even with sediment control structures and structures functioning at high levels some of the uncaptured fine sediment discharges still reach and impact stream channel habitat and resident aquatic life.

In general, observations from analyzing the SPA stream monitoring data include: 1) stream conditions will decline as intensity and degree of imperviousness of development increases, 2) the biological community in a stream undergoes a significant degree of change from impacts during the construction phase of development, and 3) streams do tend to recover from development impacts but the recovery is dependent on the intensity of the development and the resulting level of imperviousness. Streams may not recover to pre-development conditions.

OBSERVED STREAM CONDITIONS BY SPA

PINEY BRANCH SPA

The Piney Branch SPA (Figure 8) is near maximum build-out allowed under the Master Plan. Analysis conducted in 2005 by the MNCPPC found that 121 acres or five percent of the 2,369 total acres in the Piney Branch SPA remain available for development. Most of the new development has occurred in the upper portion of the watershed (upstream of monitoring station WBPB203B) and predates SPA law (Figure 9). Two developments, Willows of Potomac and Piney Glen village, together cover approximately 433 acres or 41 percent of the 1,042 acre drainage area at monitoring station WBPB203B.

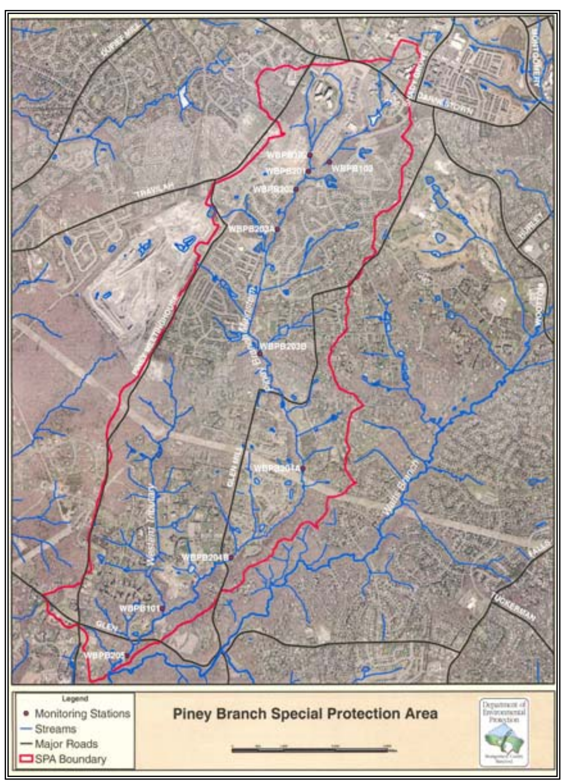

Figure 8. Piney Branch Special Protection Area

Construction on these two developments began in 1995 and was completed in 1999. As these two large development projects were nearing completion, development on the Traville property was beginning with the construction of Shady Grove Road (extended) in 1998.

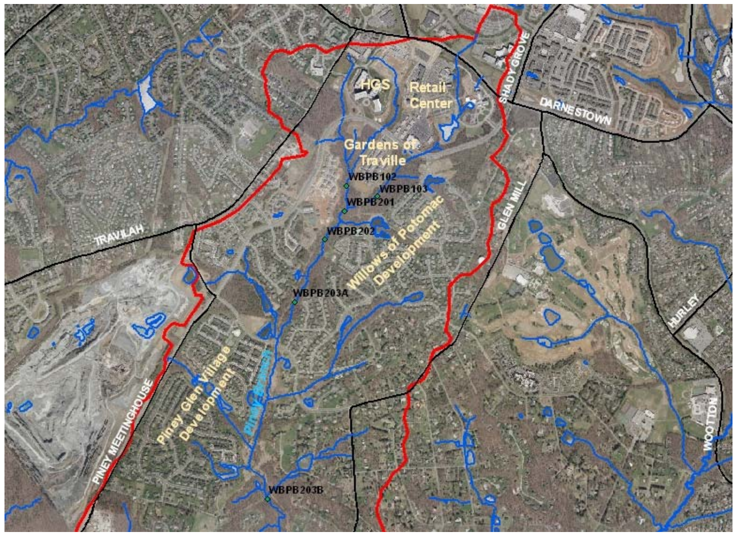

Figure 9. The 1998 Aerial photo of upper Piney Branch SPA - SPA boundary is delineated in red and stream monitoring locations are identified. Development of the Willows of Potomac, Piney Glen Village and Shady Grove Road can be seen.

Most of the development projects on the 192 acre Traville property have been completed including Human Genome Sciences, Retail Center, Avalon Bay (Lots 3 and 5) and Gardens of Traville.

Conversion from sediment control to stormwater management occurred on the last of these projects in November of 2004. Therefore, 2005 was the first year since 1995 that the stream did not receive construction sediment runoff from large-scale development projects. All runoff from these new development projects is now routed through water quality structures (e.g., StormCeptors, sand filters and biofilters) and water quantity structures (e.g., dry ponds) before being released to the stream. This along with three years of favorable stream flow (2003 – 2005) has led to improved biological condition in Piney Branch.

Macroinvertebrates

Stream monitoring results from 2005 show that the median Index of Biological Integrity (IBI) score of the benthic macroinvertebrate community sampled at nine monitoring stations along the mainstem went from *poor* in 2004 to *fair* in 2005 (Figure 10). Results from the control station located on the Western Tributary (WBPB101) during the past ten years are relatively consistent, remaining in the *good* range during most years. However, results from Piney Branch mainstem are much more variable between years. This is due to the combined effects of natural stressors (i.e., drought) and development impacts coming from large development projects in upper Piney Branch.

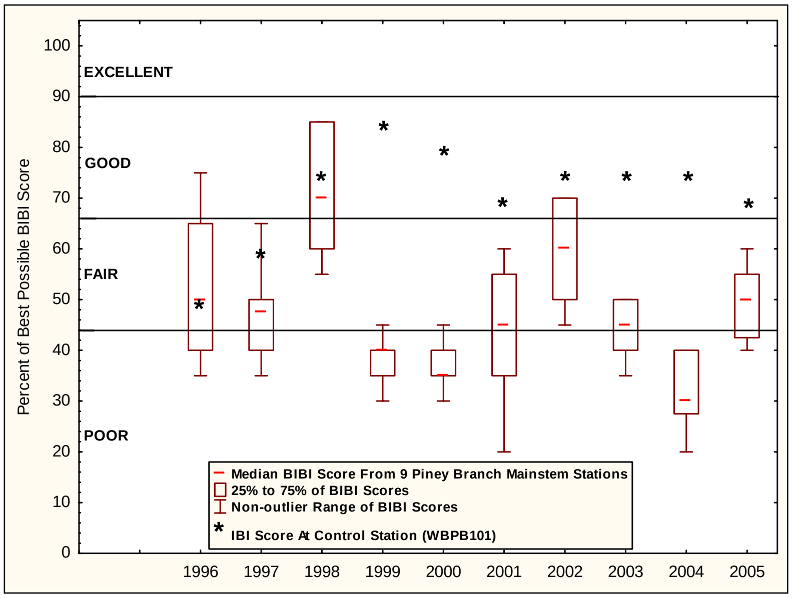

Figure 10. Results of Benthic Macroinvertebrate Monitoring in Piney Branch SPA

The change in the benthic community that accounts for most of the improvement is higher diversity. There were more aquatic insect taxa found in 2005 than 2004. However, most of the new taxa found in 2005 are tolerant aquatic insects that are commonly found in streams throughout Montgomery County. Estimates of aquatic insect abundance indicate the number of individuals in 2005 increased from 2003 and 2004 estimates (Figure 11). These are signs that aquatic insects, primarily tolerant species, are re-colonizing Piney Branch following a major disturbance in 2003 that was presumably caused by the combined effects of drought and development impacts. Because only tolerant taxa have re-colonized Piney Branch, the recovery is considered to be partial.

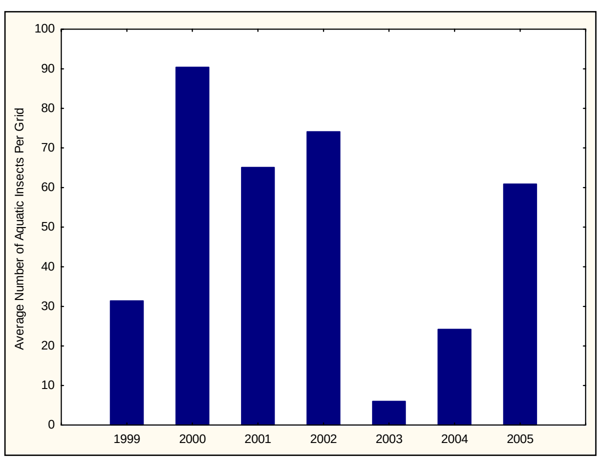

Figure 11. Average number of individuals per sub-sample grid from all Piney Branch monitoring stations

The sensitive aquatic insects such as mayflies and stoneflies that once lived in the headwaters of Piney Branch have not re-colonized at this time.

Fish

Results of fish monitoring in 2005 show little change from previous years. IBI scores from monitoring stations located in the upper portion of Piney Branch (between monitoring stations WBPB201 and WBPB203A) continue to indicate the fish community is in *fair* condition while monitoring stations further downstream remain in the *good* to *excellent* range (Figure 12). This trend has existed since monitoring began in 1995 and is due to smaller stream size and, consequently, less habitat availability in the upper portions of Piney Branch. The fish community in upper Piney Branch is made up mostly of pioneering fish species. These are hardy fish that occupy the furthest upstream portions of a stream where flow is too low and variable to support other fish species. Downstream of monitoring station WBPB203A the stream is larger and supports a more diverse fish community. Consequently, IBI scores are higher at monitoring stations located in these downstream areas.

Although not reflected so much in IBI scores, the fish community did show signs of improvement in 2005, due primarily to the increased number of sculpins. Sculpins, Potomac sculpin and Blue Ridge sculpin (Figure 13), are species that are more sensitive to stream degradation than many of the other fish species living in Piney Branch because they live on the stream bottom and are susceptible to impacts of sedimentation. The number of sculpins found in Piney Branch has increased for a second year.

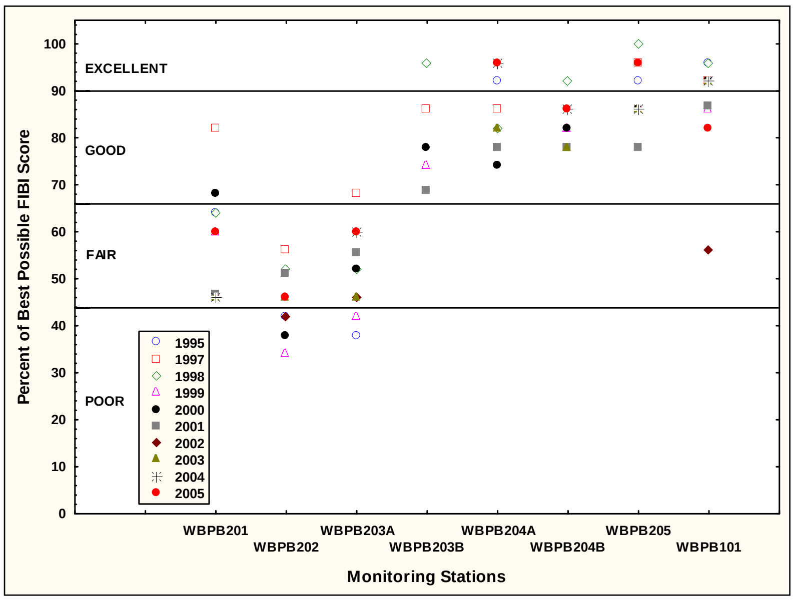

Figure 12. Fish Monitoring Results from Piney Branch

Higher numbers of sculpins and improvement in the benthic macroinvertebrate community are indications of improved stream conditions in Piney Branch. It is hoped that over the next several years with best available storm water management technology built into new development projects the biological community in Piney Branch will continue to improve.

Figure 13. Blue Ridge Sculpin

PAINT BRANCH SPA

Construction of new development projects in the Paint Branch SPA has occurred mostly in the Right Fork subwatershed. Five projects are either under development, planned for, or already built on a total of 336 acres or approximately one third of the total drainage area in the Right Fork sub-watershed. Two of these projects, Briarcliff Manor West and Fairland Community Center, have been completed. Two projects, Hunt/Lions Den and Fairland Farms, are nearing completion. One project, Peach Orchard/Allnutt, may be deeded to MNCPPC as part of a parkland mitigation package for parkland losses elsewhere due to the planned Intercounty Connector development.

Figure 14 shows the location of eight large new development projects built in the Paint Branch SPA since 1995. Projects shown in Figure 14 account for 410 acres or 75 percent of the 546 total acres developed since 1995. The remaining 25 percent are small projects (less than 4 acres) scattered throughout the Paint Branch SPA. As development projects are either nearing completion or completed, much of the land on these sites has been stabilized resulting in less sediment running off during storms. This along with improved stream flow condition over the past three years has resulted in improved biological condition throughout the Paint Branch SPA.

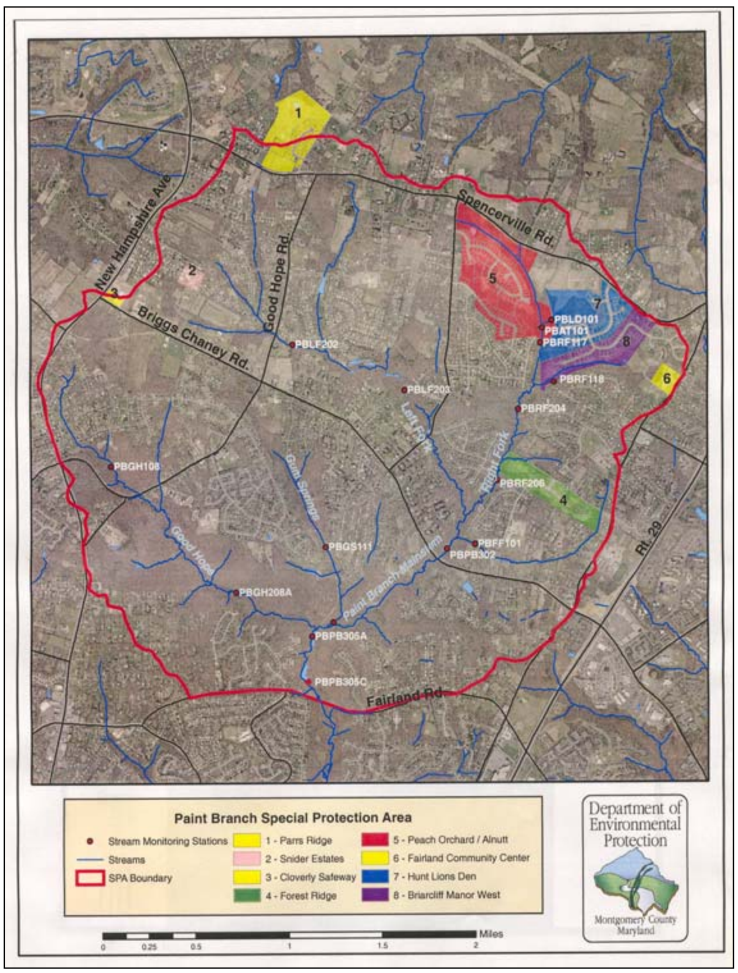

Figure 14. Paint Branch Special Protection Area

Macroinvertebrates

Benthic macroinvertebrate monitoring results from 2005 show improved condition throughout the Paint Branch SPA. IBI scores from 2005 are higher than 2004 at nine of the twelve monitoring stations (Figure 15). Again, good stream flows between 2004 and 2005 resulting in more habitat availability and better water quality (lower water temperature and higher dissolved oxygen) along with reduced sediment input to the stream because of stabilized ground on development projects are largely responsible for improved condition of the benthic macroinvertebrate community within these nine areas.

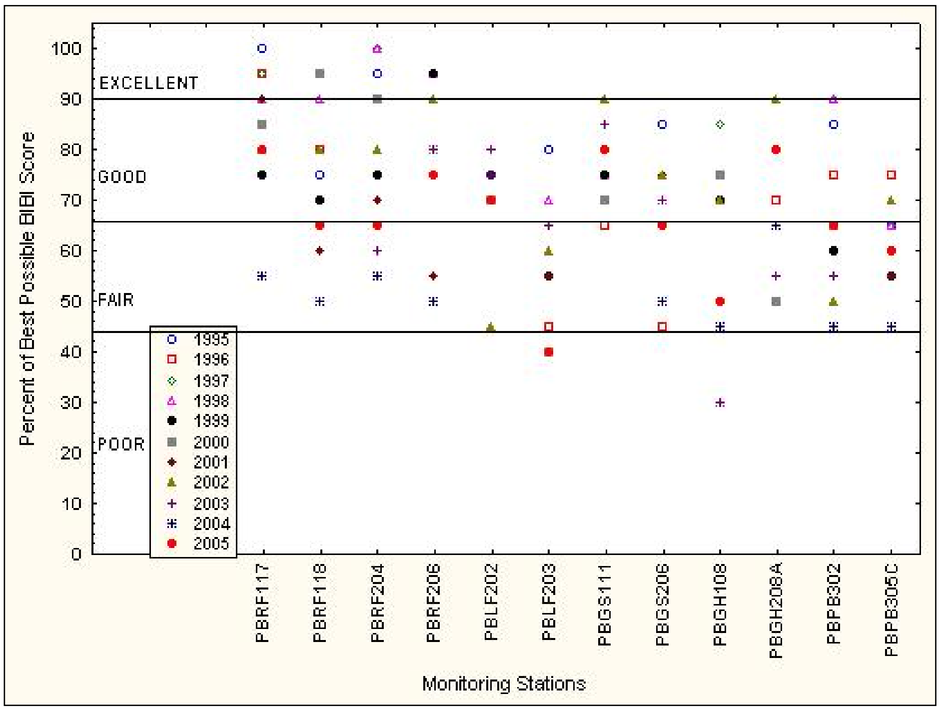

Figure 15. Benthic Macroinvertebrate Monitoring Results From Paint Branch SPA

The 2005 Right Fork subwatershed benthic macroinvertebrate IBI scores improved from *fair* to *good*, on average, over 2004 scores (Figure 16). This is particularly encouraging because condition of the benthic macroinvertebrate community in this area had remained in the *good* range during 1999 to 2002, then declined to *fair* in 2003 and 2004 before returning to *good* in 2005. Declining health of the benthic macroinvertebrate community is believed to have been by a combination of stressful drought conditions in 1999 and 2002 along

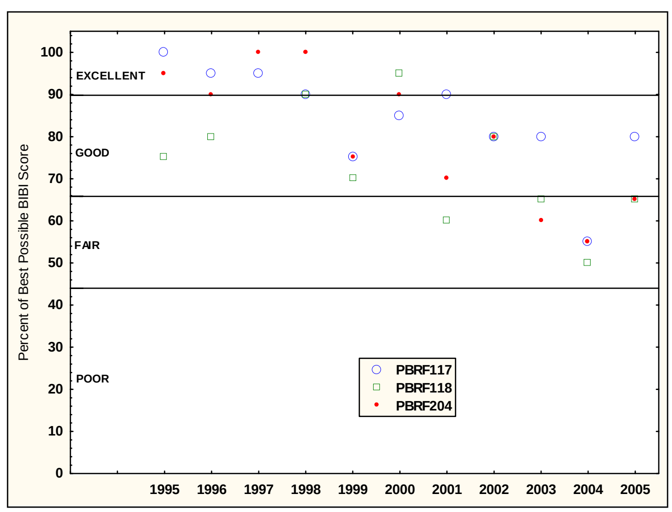

Figure 16. Benthic Macroinvertebrate Monitoring Results from the Right Fork Subwatershed

with impacts related to development activity in the Right Fork subwatershed. Average BIBI scores in 2005 from three Right Fork monitoring stations improved to *good* condition.

It is hoped that condition of the benthic macroinvertebrate community will continue to improve in the Right Fork as sediment control structures on new development sites are converted to water quality and quantity structures.

Fish

Changes in the fish community that caused higher IBI scores (Figure 17) include: 1) higher proportion of riffle/benthic fish species, e.g., Blue Ridge sculpins 2) lower proportion of tolerant fish species, e.g., Blacknose dace, 3) Higher number of intolerant species, e.g., Brown trout.

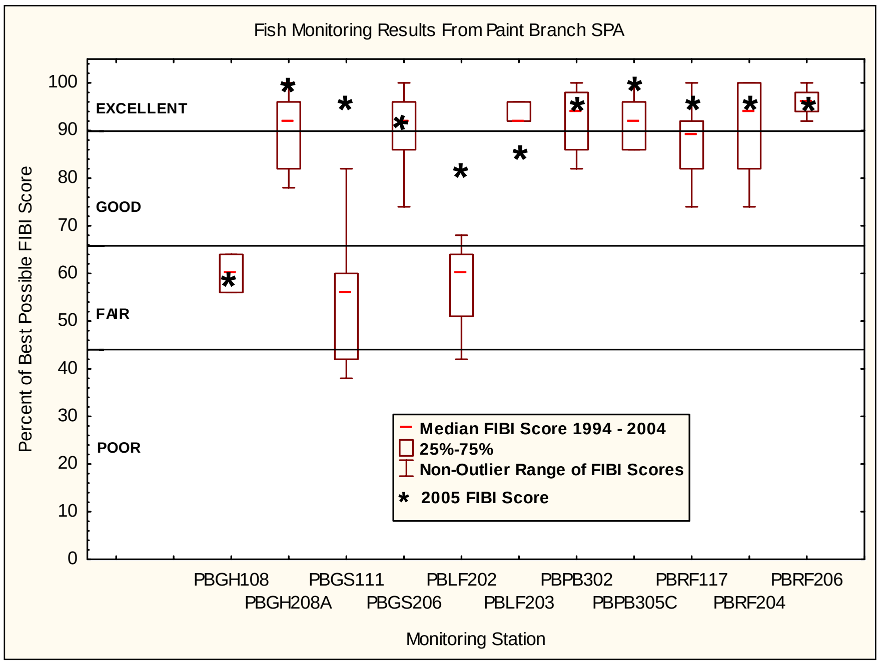

Figure 17. Results of Fish Monitoring in Paint Branch SPA

The total number of adult Brown trout found at all monitoring stations during 2005 (14) was higher than any year since 1999 which is encouraging. However, there is still much concern about the Good Hope tributary where only eight trout (five adult and three young-of-year) were found at two 75 meter monitoring stations. This tributary has historically supported the highest number of both adult and young-of-year trout. However, in 2005 more trout (both young-of-year and adult) were found in the mainstem of Paint Branch than in the Good Hope tributary.

The Maryland Department of Natural Resources (DNR) has reported a loss of habitat in the lower portion of the Good Hope tributary due to sedimentation of the stream bottom in areas where trout spawning had previously been observed which is a likely cause for low trout numbers in this tributary. Because there have been no significant development projects built in the Good Hope subwatershed during the last ten years the likely source of sediment is stream bank erosion. No effects of the SWM controls in reducing bank erosion have been seen yet. Stormwater runoff from older developments that often lack stormwater management result in frequent high flows, which erode stream banks at an accelerated rate.

Habitat Restoration and Stormwater Retrofit Measures in Paint Branch

As reported in the 2004 SPA annual report, the County is also pursuing separate stream restoration and SWM retrofit initiatives in the Upper Paint Branch SPA. These projects are being pursued to improve the management of runoff from previously developed areas and mitigate areas of habitat damage caused by development impacts that occurred before the SPA program was established. DEP, in cooperation with DPS, the MNCPPC and other agencies, have worked closely to inventory 75 potential stream habitat restoration, wetlands creation, and stormwater retrofit project opportunities. Some of these are capital projects. Others involve small habitat restoration, wetlands creation, and tree planting that can be partially implemented by volunteers.

As of the end of 2005, DEP had completed installation of nine watershed restoration projects in the Upper Paint Branch SPA. Eight projects are in the Good Hope sub-watershed and one in the Gum Springs subwatershed. One project is under development in the Gum Springs subwatershed. Another six projects are under design. One project in the Right Fork, previously under design, has been placed on hold due to property acquisition issues.

DEP has completed three restoration projects, such as the Piping Rock Road stormwater management pond (Figure 18), in the upper portion of Good Hope watershed, which provide stormwater control for 209 acres of older development where none had previously existed. These projects have been shown to reduce peak storm flow in Good Hope by 78 percent on average (SPA Annual Report 2004).

Figure 18. Piping Rock Road Stormwater Management Pond (photo taken in 2004)

Reduced peak storm flows should slow stream bank erosion, which will reduce the sediment load transported by the stream. However, it will take years for sediment currently in the Good Hope tributary to move, stabilize or be deposited within the flood plain. Hopefully, trout spawning habitat will improve year by year and the trout population will return to levels recorded by DNR over a 20 year period (1979 – 1999).

Immediately downstream of the SPA an additional 2.25 miles of stream restoration has been completed on the Paint Branch mainstem between Fairland Road and Route 29. Stream restoration along this stretch of Paint Branch includes bank stabilization, tree planting, lunkers and woody debris placement (for fish habitat), grade control, and channel relocation to protect a historical site. This restoration is expected to significantly improve the quality, variety, and availability of habitat for brown trout and other species. This project was installed by the United States Army Corps of Engineers in fulfillment of a cooperative cost share agreement with the County.

DEP completed a new watershed study, primarily for the Lower Paint Branch, which will also include some further evaluation on additional project opportunities for reducing stormwater impacts within the Upper Paint Branch SPA.

Case studies on several of these restoration and retrofit projects are presented in the 2004 Special Protection Area annual report (available at: http://www.montgomerycountymd.gov/content/dep/SPA/2004report.pdf).

CLARKSBURG SPA

Land use change in the Clarksburg SPA far exceeds that of the other three SPAs. During 2005, development was either underway or completed on eighteen development projects (Figure 19) for a total of 1,409 acres. Most of this new development is located within the

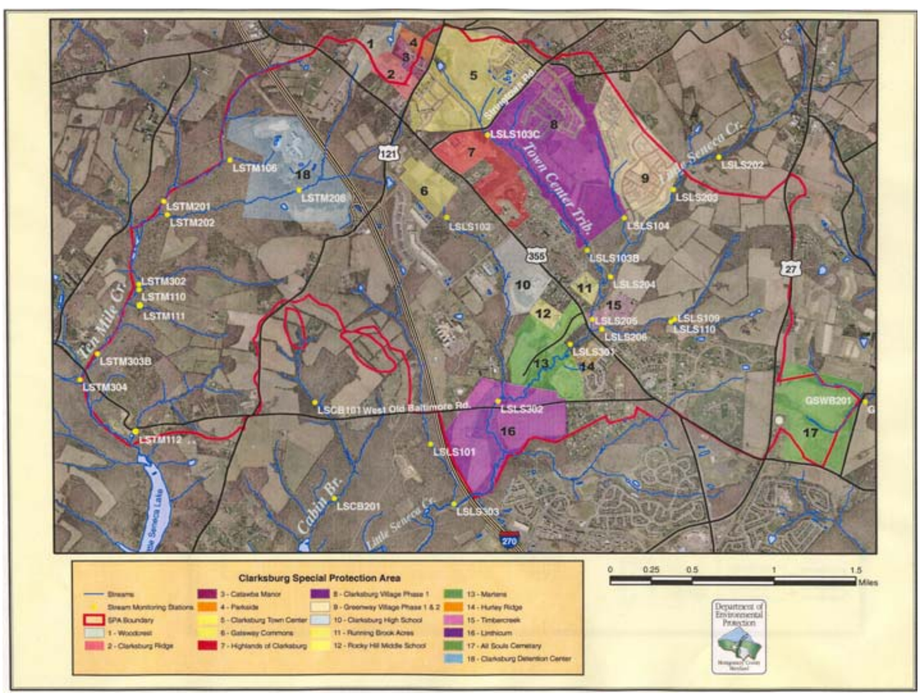

Figure 19. Map of Clarksburg SPA - Development Projects where Construction is Either Completed or Underway in 2005 are Color Shaded

Little Seneca Creek watershed and concentrated in and around the new Clarksburg Town Center. In addition, many parcels in the Clarksburg master plan area were designated as TDR receiving areas after the master plan was adopted which increased imperviousness.

Macroinvertebrates

The 2005 stream monitoring results from the undeveloped areas of the Clarksburg SPA are consistent with other SPAs in that they show overall stream conditions continue to improve from impacts caused by the 2002 drought. For example, average IBI scores calculated from benthic macroinvertebrate sampling completed throughout the Clarksburg SPA show a five percent improvement between 2003 and 2005 (Figure 20). Higher than average rainfall in 2005 and consequently higher stream flow provides favorable conditions for benthic macroinvertebrates and is the likely cause for improved IBI scores. Although the average IBI score did improve in 2005 it remains below levels recorded during the pre-development period of 1995 – 2000.

Biological health has not fully recovered in areas undergoing development because of ongoing development impacts. Analysis of biological data from two groups of monitoring stations shows a significant difference between stations with development activity in their drainage area and those without (Figure 21). Group 1 consists of monitoring stations located directly downstream of ongoing development areas and Group 2 consists of monitoring stations that are not directly downstream of ongoing development areas. The two groups are consistent during the pre-development period of 1995 – 2002. Group 1 IBI scores were within the *good* range during this time while Group 2 IBI scores were within the *excellent* to *good* range.

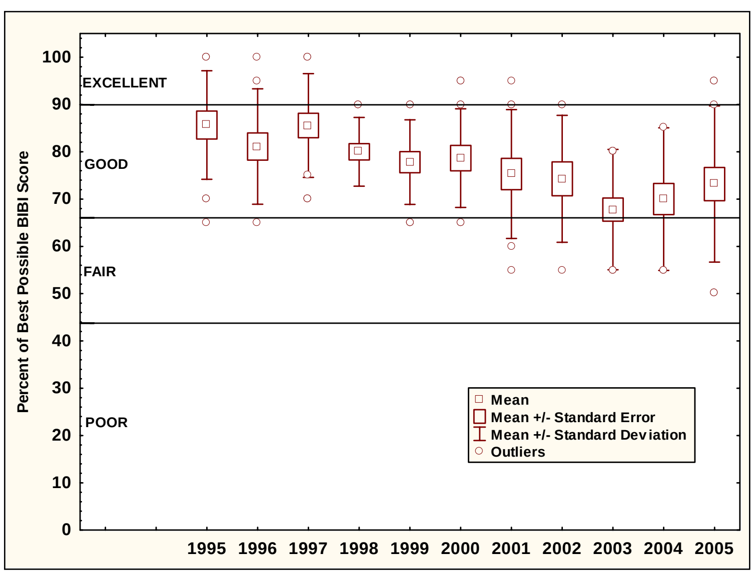

Figure 20. All Benthic Macroinvertebrate Monitoring Results from Clarksburg SPA

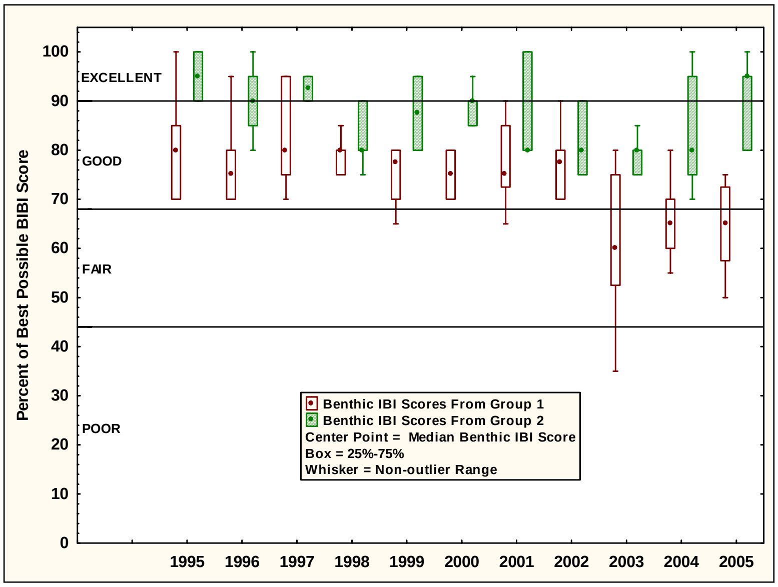

Figure 21. Benthic Macroinvertebrate Monitoring Results from Two Groups of Monitoring Stations. Group 1 - Within Development Area. Group 2 – Outside Development Area.

In 2003, Group 1 exhibited an abrupt drop in IBI scores from a median of *good* to *fair* in response to combined effects of the 2002 drought and development impacts.
During subsequent years of 2004 and 2005, Group 1 monitoring stations have remained in the *fair* range while the Group 2 stations are in the *good* to *excellent* range. Impacts that are likely inhibiting biological recovery at the Group 1 stations include: 1) a water main break that released chlorinated water to the Town Center Tributary in 2003, 2) sedimentation of the stream bottom (Figure 22), and 3) abrupt and brief increases in water temperature which occur either during larger rain storms as warm water from sediment traps is flushed out or when maintenance of the trap requires that the permanent pool be pumped down.

Figure 22. Stream Bottom at Station LSLS103C

Development impacts thus far have been most severe in the Town Center Tributary, which receives runoff from three large development projects (Figure 19). Although results of 2005 monitoring show stream conditions as measured by benthic macroinvertebrate community health has improved from *poor* ratings in 2003 and 2004, it remains lower than baseline values established from 1995 – 2002 (Figure 23). This suggests that ongoing development impacts are hampering a recovery of the benthic macroinvertebrate community in the Town Center Tributary. For example, some sediment and erosion control devices have not been converted to SWM as speedily as they could be. Preliminary results from 2006 monitoring indicates the decline in stream conditions continues.

A tributary (referred to here as LSLS104) located between the Greenway Village and Clarksburg Village developments also has large-scale development projects occurring within its watershed. Year 2005 monitoring results from station LSLS104 show stream conditions of this tributary has remained within the *good* range (Figure 23). In early 2005, grading was underway on only a small portion of Clarksburg Village Phase I near the intersection of Stringtown Road and Piedmont Road. Grading expanded to the rest of the site later in 2005, which opened up approximately 200 acres of ground.

Although the overall 2005 stream conditions remain in the *good* range, analysis of the aquatic insect community shows that there has been a significant reduction in sensitive aquatic insect taxa. For example, Amphinemura, a sensitive stonefly taxa, was found to represent 42 percent of the overall community on average between 1998 and 2004. In 2005, Amphinemura represent 3 percent of the overall community. Preliminary results from 2006 show even fewer individuals of these sensitive aquatic insect taxa. Indeed, the 2006 stream conditions (using the benthic IBI) dropped into the *fair* range. Similar trends were observed in the Town Center Tributary in 2003 when the stream condition dropped to the *poor* range and the proportion of Amphinemura dropped to 1 percent in 2003 from an average of 41 percent during the period 1997 – 2002.

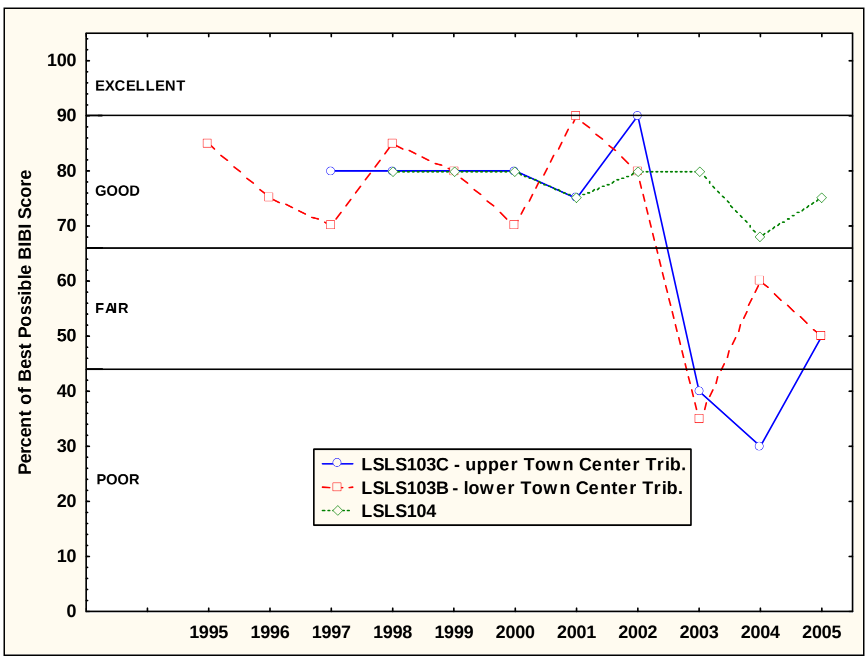

Figure 23. Benthic Macroinvertebrate Monitoring Results from the Town Center Tributary and Monitoring Station LSLS104

It is expected that as development expands in Clarksburg the stream conditions will decline further. This has been the trend in SPAs where large-scale development projects have occurred.

UPPER ROCK CREEK SPA

A portion of the Upper Rock Creek watershed was designated as a SPA in the Olney Master Plan (February 2004). The Upper Rock Creek SPA includes the entire Upper Rock Creek watershed north of Muncaster Mill Road and west of the North Branch of Rock Creek (Figure 24). Five development projects were active during the reporting period with 16.2 acres of actively disturbed area.

Prior to being designated an SPA DEP had established sixteen (16) fixed monitoring stations throughout the Upper Rock Creek watershed to assess stream condition as part of the Countywide Stream Protection Strategy (CSPS). Biological sampling (fish and benthic macroinvertebrates) was first completed at these stations in 1995. The watershed was monitored again in 2002. Results from this sampling indicate that most streams in the SPA portion of the Upper Rock Creek watershed are in *good* to *excellent* condition. The watershed is monitored once during every five year countywide monitoring cycle.

When the Upper Rock Creek SPA was designated, DEP established six new monitoring stations (Figure 24) from which biological sampling (benthic macroinvertebrates only),

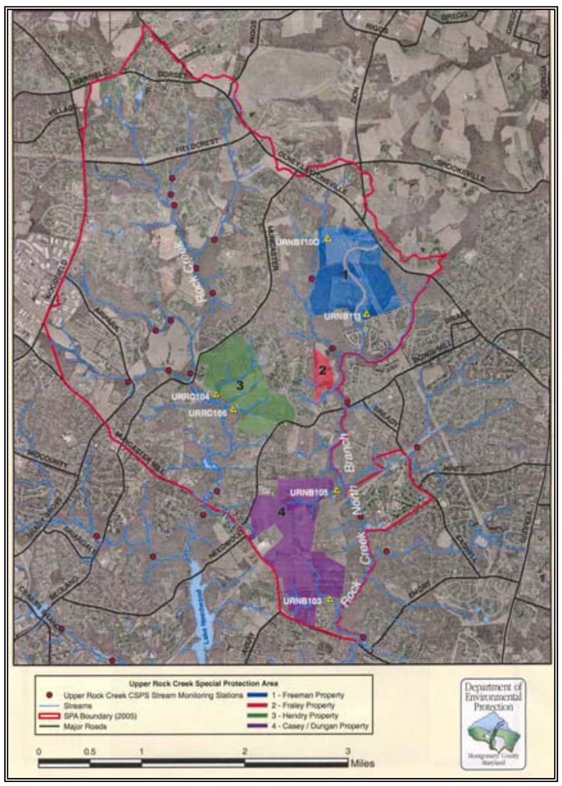

Figure 24. Upper Rock Creek SPA – Six SPA Monitoring Stations added in 2004 to track conditions downstream of large developable land parcels are shown (yellow triangles) and labeled.

habitat assessment and water quality measurements will be done annually. The six monitoring stations are located in small tributaries that drain parcels of land slated for development. Because of the very small stream size at all six monitoring stations, fish monitoring was not done.

Benthic macroinvertebrate sampling was completed at all six monitoring stations in 2004 and 2005. Results show stream conditions in all of these streams in the *good* to *excellent* range. The biological community is indicative of good habitat and water quality conditions.

IV. SUMMARY

Development of new SPA development projects over the last ten years has been concentrated in three areas: 1) Traville – located in the headwater area of Piney Branch, 2) the Right Fork of Paint Branch, and 3) Clarksburg Town Center. The stream condition in these watersheds has declined. However, the level of decline varies with the intensity and imperviousness levels of the new development. For example, the Clarksburg Town Center Tributary, which receives runoff from medium to high imperviousness level development, declined from *good* to *poor* during the development period when much of the drainage area was being disturbed through grading and clearing. In contrast, the Right Fork of Paint Branch, where new development is not as intense and has a 10 percent impervious cap, declined from *excellent* to *fair/good*. Construction of new development in the Traville area of Piney Branch and the Right Fork of Paint Branch has, for the most part, been completed. Biological health of streams in both of these areas appears to be recovering although not to pre-development levels. The Clarksburg Town Center Tributary, which continues to receive runoff from active development projects, has not shown any sign of recovery as biological health remains in *poor* condition.

Observations from analyzing the SPA stream monitoring data include: 1) stream conditions will decline as intensity and degree of imperviousness of development increases, 2) the biological community in a stream undergoes a significant degree of change from impacts during the construction phase of development, and 3) streams do tend to recover from development impacts but the recovery is dependent on the intensity of the development and the resulting level of imperviousness. Streams may not recover to pre-development conditions.

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RELATED DOCUMENTS:

- SPA Annual Report, 2004
- SPA Annual Report, 2003
- SPA Annual Report, 2002
- SPA Annual Report, 2001
- SPA Annual Report, 2000
- SPA Annual Report, 1999
- SPA Annual Report, 1998
- Clarksburg Conservation Plan
- Piney Branch Conservation Plan
- Upper Paint Branch Conservation Plan

All of the documents cited above are available online in PDF format on our website:
http://www.montgomerycountymd.gov/deptmpl.asp?url=/content/dep/SPA/home.asp
In addition, the Department of Environmental Protection maintains an extensive collection of annual, technical, and general reports, public information factsheets, and related publications. Many are available in both PDF and HTML format, and in some cases, print copies of documents are available. Please contact us for more information.

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